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RF Acceleration with Short Pulses: Breaking the High-Gradient Barrier

Monday 2 June 2025 11:30 (30 minutes)

Achieving high-gradient acceleration is critical to enabling future linear colliders, free-electron lasers, and compact accelerator applications. Pioneered by the Argonne Wakefield Accelerator (AWA) group, short-pulse SWFA (structure wakefield accelerator) technology has shown remarkable promise in surpassing the long-standing barrier of ~ 100 MV/m in X-band normal conducting structures. Recent experiments have demonstrated the feasibility of this approach, with the gradient exceeding 300 MV/m in a variety of X-band accelerating structures and an X-band photogun. Experimental results indicate that the well-known empirical scaling law to estimate the RF breakdown rate ($BDR \propto E^{30} t^5$) may be too conservative when the RF pulse durations below 10 ns. A conceptual design of ultracompact XFEL based on the short pulse acceleration will be presented.

Footnotes

Funding Agency

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Session Classification: Plenary after coffee